instructions (e.g., receive instructions to perform a self-test, receive instructions to "trip" (interrupt the circuit), receive instructions to "reset", etc.).

[0056] It should be understood by a person of ordinary skill in the art that the individual blocks represented in FIG. **1**A do not necessarily represent individual components. Rather any suitable combination of these blocks may be implemented by a single component such as, but not limited to, a microprocessor, integrated circuit, or the like. Similarly, any given block may be implemented by more than one circuit component without departing from the spirit of the invention.

[0057] As shown in FIGS. **6** and **7**, the AFCI system **5** can be sized and arranged to be disposed within a housing **200**, the housing being configured to be installed in a single gang electrical enclosure, e.g., a wall-box mounted AFCI. In other embodiments, the AFCI system may be housed or mounted in any suitable form factor such as, but not limited to, a circuit breaker, a panel mount device, an in-line device, or the like.

[0058] Alternative embodiments of an AFCI system **6**, **6**.**1** and **6**.**2** are shown in FIGS. **3**A, **3**B, and **3**C. FIGS. **3**D, **3**E, and **3**F are more detailed views of the components in the embodiment in FIG. **3**C. Any of these embodiments of the AFCI system may employ any one of the wiring configurations shown in FIGS. **1**B-**1**F, or any one of the sensor configurations shown in FIGS. **2**C-**2**F.

[0059] As illustrated in FIG. **1**A, device **5** includes line side connections **11** and load side connections **70**. Line side connections **11** include a first line contact **12** and a second line contact **14**. First line contact **12** is coupled to first conductive path **16** (i.e., a line side phase conductive path), while second line contact **14** is coupled to second conductive path **18** (i.e., a line side neutral conductive path). Contacts **12**, **14** can be in the form of terminal screws, wire leads, or other connections known in the art that can be coupled to a power line. First conductive path **16** and second conductive path **18** form a circuit and in the embodiment shown in FIG. **1**A, the first conductive path **16** is arranged to conduct current in the same direction as the second conductive path **18** relative to the sensors **22** and **24**. Sensor **20** which can be any one of sensors **22**, and **24** may be any suitable sensor known in the art, and may include a single sensor or two or more sensors. In this exemplified embodiment, sensor **20** includes two sensors **22** and **24**, wherein one sensor is a high frequency sensor and the other sensor is a low frequency/power line sensor. It should be understood that, although in this embodiment both are depicted (as well as in the embodiments of FIGS. **1**B-**1**H), it is not required to have both a high frequency sensor and a low frequency/power line sensor.

[0060] Load side **70** may be separated from line input conductive paths **11** by separable contacts **62**, which include separable contacts **64** and **66**. Load side **70** includes a first load side conductive path **17**, which can be a load side phase line, and a second load side conductive path **19**, which can be a load side neutral line. Contact **64** is configured to separate first line side conductive path **16** from first load side conductive path **17** and contact **66** is configured to separate second line side conductive path **18** from second load side conductive path **19**.

[0061] High frequency sensor **22** may be in the form of any high frequency sensor known in the art. In at least one embodiment, the high frequency sensor **22** may be a transformer having a coil wound around an air core (e.g.—a Rogowski coil) or a high permeability magnetic core (e.g., an iron powder core where powdered iron is encapsulated in an epoxy substrate). It should be noted that the term "air core" may refer to any core where the core is non-ferrous, e.g., plastic or any suitable material. Low frequency/power line sensor **24** can be in the form of any low frequency sensor known in the art. In at least one embodiment, the low frequency sensor **24** may be a typical current sensor or current transformer.

[0062] In addition, in other alternative embodiments, a differential current sensor **26** may be used to detect arc faults to ground. Accordingly, in this view, differential sensor **26** is shown in dashed lines to indicate that it may be optionally used or not used in certain embodiments. This differential sensor **26** may also be employed in the embodiments shown in FIGS. **1**B-**1**H, **3**A, **3**B, **3**C, and **3**E. While sensors **20**, **22**, **24** and **26** are shown in the drawings, the claims are not to be construed as requiring any one of the above listed sensors **20**, **22**, **24**, **26** unless as expressed in writing in those claims.

[0063] The high frequency sensor **22**, the low frequency sensor **24**, and the optional differential sensor **26** are preferably arranged and configured to detect different signals, or conditions, on conductive paths **16** and **18**. In at least one embodiment, the low frequency sensor **24** has a high permeability iron powder core. This allows for the core to be manufactured with a relatively small size while avoiding saturation with a wide range of input signals. For example, one type of transformer core (produced by Micrometals, Inc.) is a current transformer core which is close to a standard T50-45 and Al parameter (44.0 nH/(N*N)), although any other suitable type of transformer can be used as well.

[0064] Advantageously, with both a low frequency sensor **24** and a high frequency sensor **22**, arc faults can be detected with greater precision and/or reliability. Preferably, each sensor is configured to detect arc faults in the pre-determined frequency range. For example, the low frequency sensor **24** may be configured to detect electrical characteristics of a current path which may be indicative of arc faults at the predetermined frequency range of, preferably a power line frequency or in another embodiment at a higher frequency e.g., 0-2 MHz or 0-4 MHz. The high frequency sensor **22** is preferably configured to detect electrical characteristics of a current path which may be indicative of arc faults at a predetermined frequency range higher than the low frequency sensor, e.g. greater than a predetermined frequency that is in at least one embodiment higher than power line frequency, such as greater than or equal to 1 MHz, alternatively greater than or equal to 2 MHz or greater than or equal to 4 MHz. In certain preferred embodiments, the range for the high frequency sensor **22** may be 1-10, MHz, alternatively, 2-10 MHz, and in other embodiments the range for the high frequency sensor may be 4-10 MHz.

[0065] In alternative embodiments, the addition of an optional differential sensor **26** to supplement/complement the high frequency sensor **22** and low frequency sensor **24**, creates a system where parallel arc faults to ground can also be detected by measuring the differential current between the phase and neutral conductive paths.

[0066] In yet another alternative embodiment, a shunt **25** (see FIGS. **1**F and **1**H) may be employed. The shunt **25** preferably has a known resistance along its path and can be incorporated into the phase conductive path **16**, the neutral